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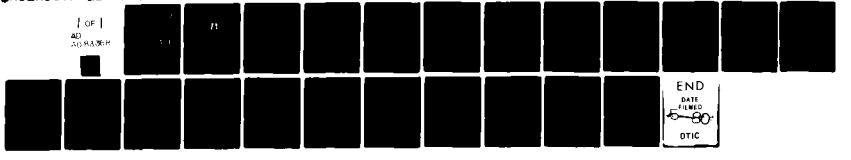

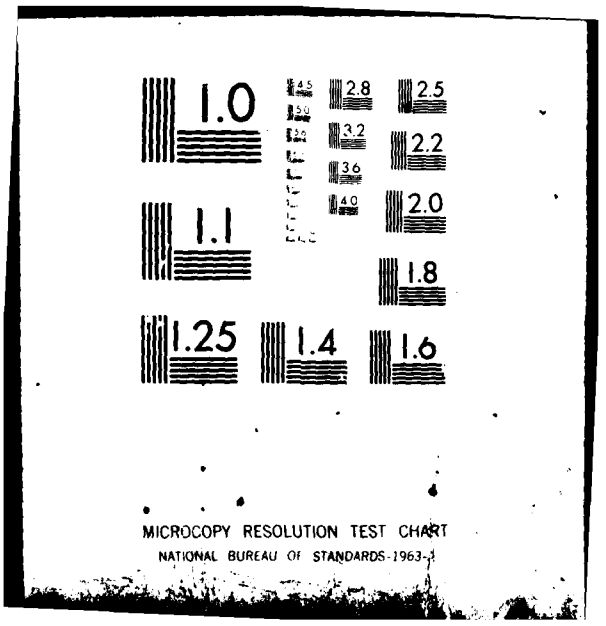
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FOREIGN TECHNOLOGY DIVISION

METALLIC AND NONMETALLIC INORGANIC COATINGS.
GENERAL REQUIREMENTS FOR THE SELECTION OF COATINGS

Approved for public release;
distribution unlimited.

EDITED TRANSLATION

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METALLIC AND NONMETALLIC INORGANIC COATINGS. GENERAL REQUIREMENTS FOR THE SELECTION OF COATINGS

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U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yë or ë.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

0871

METALLIC AND NONMETALLIC INORGANIC COATINGS.

General Requirements for the Selection of Coatings

GOST 14623-69

By resolution of the Committee of Standards, Measures and Measuring Instruments of the Council of Ministers USSR, 25 April 1969, No. 514, implementation date 1 January 1970

1. This standard is extended to protective and protective-decorative metallic and nonmetallic coatings applied by electrodeposition, chemical, anodizing, heat, diffusion, metallization, and condensation methods, and it establishes the main requirements for the selection of coatings.

The branch, republic and plant standards on the selection of coatings are developed and confirmed in the established sequence on the basis of the requirements of this standard.

2. When selecting coatings, one must consider:

- the purpose of the part,

- the material of the part,

- the operating conditions,

- the purpose of the coating,

- the properties of the coating,

- the method of applying the coating,

- the admissibility of the contact of adjacent metals,

- economic expediency.

3. The minimum thickness of coatings established by the coating

selection standards should provide the required protective capacity of the coatings or its other special properties.

4. The main types of protective and protective-decorative coatings used under different operating conditions are given in Table 1.

Table 1.

(1) Основной металл	(2) Вид покрытия по ГОСТ 9791—68	(3) Условия эксплуатации по ГОСТ 14937—69			
		Л (4)	С (5)	Ж (6)	ОЖ (7)
(8) Сталь	(9) Цинковое электролитическое	+	+	—[1]	—[1]
	(10) Цинковое электролитическое с хроматированием	+	+	+	+[2]
	(11) Цинковое электролитическое с фосфатированием и хроматированием	—	—	+	+[2]
	(12) Цинковое электролитическое с хроматированием и лакокрасочным покрытием	—	+	+	+
	(13) Цинковое электролитическое с фосфатированием и лакокрасочным покрытием	—	+	+	+
	(14) Цинковое электролитическое с покрытием лаками	—	+	+	—
	(15) Цинковое горячее	—	+	+	+[2]
	(16) Цинковое горячее с фосфатированием или хроматированием	—	+	+	+[2]
	(17) Цинковое горячее с хроматированием и промасливанием	—	+	+	+[2]
	(18) Цинковое металлизационное	—	+	+	+[2]
	(19) Цинковое диффузионное	—	+	+	+
	(20) Цинковое диффузионное с фосфатированием или хроматированием	—	+	+	+
	(21) Цинковое конденсационное с хроматированием	+	+	+	+[2]
	(22) Цинковое электролитическое с оксидированием в черный цвет	+	+	+	+[2]
	(23) Кадмиевое электролитическое	+	+	—[1]	—[1]
	(24) Кадмиевое электролитическое с хроматированием или фосфатированием	—[3]	+	+	+
	(25) Кадмиевое электролитическое с хроматированием или фосфатированием и лакокрасочным покрытием	—[3]	+	+	+
	(26) Кадмиевое конденсационное	—[3]	+	+	+
	(27) Кадмиевое конденсационное с хроматированием	—[3]	+	+	+
	(28) Кадмиевое электролитическое с покрытием лаками	—[3]	+	+	+
	(29) Покрытие сплавом кадмий — цинк	+	+	+	+
	(30) Покрытие сплавом цинк — олово	+	+	+	+
	(31) Оловянное электролитическое	+	—	—	—
	(32) Оловянное электролитическое по подслою никеля	+	+	+	+[4]
	(33) Оловянное по подслою меди	+	+	+	+[4]
	(34) Оловянное с оплавлением	+	+	—	—
	(35) Оловянное горячее	+	+	+	+[4]
	(36) Покрытие сплавом олово — свинец по подслою меди	+	+	+	+
	(37) Покрытие сплавом олово — свинец по подслою никеля и меди	+	+	+	+

KEY: (1) Base metal. (2) Type of coating according to GOST 9791-68. (3) Operating conditions according to GOST 14007-68. (4) Mild. (5) Moderate. (6) Severe. (7) Very severe. (8) Steel. (9) Electrodeposited zinc. (10) Chrome-plated electrodeposited zinc. (11) Phosphate-coated and chrome-plated electrodeposited zinc. (12) Chrome-plated electrodeposited zinc with paint-and-varnish coating. (13) Phosphate-coated electrodeposited zinc with paint-and-varnish coating. (14) Lacquer-coated electrodeposited zinc. (15) Hot zinc. (16) Chrome-plated or phosphate-coated hot zinc. (17) Chrome-plated and oiled hot zinc. (18) Metallated zinc. (19) Diffused zinc. (20) Chrome-plated or phosphate-coated diffused zinc. (21) Chrome-plated condensed zinc. (22) Electrodeposited zinc oxidized to a black color. (23) Electrodeposited cadmium. (24) Chrome-plated or phosphate-coated electrodeposited cadmium. (25) Chrome-plated or phosphate-coated electrodeposited cadmium with paint-and-varnish coating. (26) Condensed cadmium. (27) Chrome-plated condensed cadmium. (28) Varnished electrodeposited cadmium. (29) Cadmium-zinc alloy coating. (30) Zinc-tin alloy coating. (31) Electrodeposited tin. (32) Electrodeposited tin on a nickel sublayer. (33) Tin on a copper sublayer. (34) Fused tin. (35) Hot tin. (36) Tin-lead alloy coating on copper sublayer. (37) Tin-lead alloy coating on nickel and copper sublayer.

Table 1 (cont'd).

(1) Основной металл	(2) Вид покрытия по ГОСТ 9791—68	(3) Условия эксплуатации по ГОСТ 15007—68			
		Л(4)	С(5)	Ж(6)	ОЖ(7)
(8) Сталь	(9) Покрытие сплавом олово — никель по подслою меди	—	+	+	—
	(10) Никелевое электролитическое	+	+	+	+5
	(11) Никелевое химическое	+	—	—	—
	(12) Никелевое химическое с пропиткой гидрофобизирующей жидкостью	+	+	—	—
	(13) Многослойные покрытия:				
	(14) медь — никель	+	+	+	—
	(15) медь — никель — хром	+	+	+	+6
	(16) никель — хром	+	+	+	+6
	(17) медь — никель — сплав олово — никель — хром	—	—	+	+6
	(18) медь — никель — хром черный	+	+	+	+6
	(19) медь — хром	+	+	—	—
	(20) латунь — хром	+	+	—	—
	(21) Хромовое молочное	+	+	+6	+6
	(22) Хромовое комбинированное	+	+	+	+
	(23) Хромовое твердое	+	+	+6	—
	(24) Покрытие сплавом медь — цинк (латунь)	+	+	—	—
	(25) Фосфатное	+	—	—	—
	(26) Фосфатное с промасливанием	+	+	—	—
	(27) Фосфатное с лакокрасочным покрытием	+	+	+	+
	(28) Хромовое диффузионное	—	+	+	+
	(29) Окисное	+	—	—	—
	(30) Окисное с лакокрасочным покрытием	+	+	+	+
	(31) Алюминиевое горячее	—	+	+	+
	(32) Алюминиевое конденсационное	+	+	+	+
	(33) Алюминиевое металлизационное	—	+	+	+
	(34) Титановое конденсационное	—	+	+	+
(35) Чугун	(36) Цинковое горячее с хроматированием или фосфатированием	+	+	+	+3
	(37) Цинковое горячее с фосфатированием и промасливанием	+	+	+	+3
	(38) Цинковое металлизационное	—	+	+	+3
	(39) Цинковое металлизационное с лакокрасочным покрытием	+	+	+	+
	(40) Окисное	+	—	—	—
	(41) Окисное фосфатное	+1	—	—	—
	(42) Фосфатное с промасливанием	+1	+1	—	—
(43) Медь и медные сплавы	(44) Никелевое электролитическое	+	+	+	+7
	(45) Никелевое химическое	+	+	—1	—1
	(46) Никелевое черное	+	—	—	—
	(47) Хромовое по подслою никеля	+	+	+	+
	(48) Хромовое черное по подслою никеля	+	—	—	—
	(49) Хромовое молочное	+	+	+	+6

KEY: (1) Base metal. (2) Type of coating according to GOST 9791-68. (3) Operating conditions according to GOST 14007-68. (4) Mild. (5) Moderate. (6) Severe. (7) Very severe. (8) Steel. (9) Tin-nickel alloy coating on copper sublayer. (10) Electrodeposited nickel. (11) Chemical nickel. (12) Chemical nickel impregnated by a water-repellent liquid. (13) Laminar coatings. (14) copper-nickel. (15) copper-nickel-chromium. (16) nickel-chromium. (17) copper-nickel alloy of tin-nickel-chromium. (18) nickel-chromium. (19) copper-nickel-black chromium. (20) copper-chromium. (21) brass-chromium. (22) Milky chromium. (23) Combined chromium. (24) Hard chromium. (25) Copper-zinc (brass) coating. (26) Phosphate. (27) Oiled phosphate. (28) Phosphate with paint-and-varnish coating. (29) Diffused chromium. (30) Oxide. (31) Oxide with paint-and-varnish coating. (32) Hot aluminum. (33) Condensed aluminum. (34) Metallated aluminum. (35) Condensed titanium. (36) Cast iron. (37) Chrome-plated or phosphate-coated hot zinc. (38) Phosphate-coated or oiled hot zinc. (39) Metallated zinc. (40) Metallated zinc with paint-and-varnish coating. (41) Oxide. (42) Phosphate oxide. (43) Oiled phosphate. (44) Copper and copper alloys. (45) Electrodeposited nickel. (46) Chemical nickel. (47) Ferrous nickel. (48) Chromium on nickel sublayer. (49) Ferrous nickel on nickel sublayer. (50) Milky chromium.

Table 1 (cont'd).

(1) Основной металл	(2) Вид покрытия по ГОСТ 9791–68	(3) Условия эксплуатации по ГОСТ 14007–68			
		Л(4)	С(5)	Ж(6)	ОЖ(7)
(8) Медь и медные сплавы	(9) Хромовое черное по подслою никеля и хрома	—	+	+	+[6]
	(10) Оловянное электролитическое	+	+	+	+[6]
	(11) Оловянное по подслою никеля	+	+	+	+[6]
	(12) Покрытие сплавами олово—свинец	+	+	+	+
	(13) Покрытие сплавами олово — свинец с оплавлением	+	+	+	+
	(14) Покрытие сплавами олово—свинец горячее	+	+	+	+
	(15) Покрытие сплавом олово—висмут	+	+	+	—
	(16) Покрытие сплавом олово—никель	+	+	+	+
	(17) Серебряное электролитическое	+	+	—[1]	—[1]
	(18) Серебряное электролитическое с лаковыми защитными пленками	+	+	+	+
	(19) Покрытие сплавом серебро — сурьма	+	+	—	—
	(20) Золотое электролитическое	+	+	—	—
	(21) Покрытие сплавом золото — медь	+	+	—	—
	(22) Палладиевое по подслою никеля или серебра	+	+	+[7]	+[7]
	(23) Родиевое по подслою никеля или серебра	+	+	+[7]	+[7]
	(24) Пассивное	+	—	—	—
	(25) Пассивное с лакокрасочным покрытием	—	+	+	—
	(26) Окисное химическое или анодизационное с промасливанием	+	—	—	—
	(27) Окисное химическое с лакокрасочным покрытием	—	+	+	+
(28) Алюминий и его сплавы	(29) Никелевое по подслою меди	+	+	—	—
	(30) Никелевое химическое	+	+	—	—
	(31) Хромовое	+	+	+	+[6]
	(32) Хромовое по подслою никеля	+	+	+	+[6]
	(33) Хромовое по подслою меди и никеля	+	+	+	+[6]
	(34) Серебряное по подслою никеля и меди	+	—	—	—
	(35) Окисное химическое с хроматированием	+	—	—	—
	(36) Окисное химическое с промасливанием	+	—	—	—
	(37) Окисное химическое с хроматированием и лакокрасочным покрытием	—	+	+	+[5]
	(38) Окисное с фосфатированием и лакокрасочным покрытием	+	+	+	+[5]
	(39) Окисное анодизационное наполненное водой	+	+	+	+
	(40) Окисное анодизационное с хроматированием	+	+	+	+[6]

KEY: (1) Base metal. (2) Type of coating according to GOST 9791-68. (3) Operating conditions according to GOST 14007-68. (4) Mild. (5) Moderate. (6) Severe. (7) Very severe. (8) Copper and copper alloys. (9) Ferrous chromium on nickel and chromium sublayer. (10) Electrodeposited tin. (11) Tin on nickel sublayer. (12) Tin-lead alloy coating. (13) Fused tin-lead alloy coating. (14) Hot tin-lead alloy coating. (15) Tin-bismuth alloy coating. (16) Tin-nickel alloy coating. (17) Electrodeposited silver. (18) Electrodeposited silver with protective lacquer films. (19) Silver-antimony alloy coating. (20) Electrodeposited gold. (21) Gold-copper alloy coating. (22) Palladium on nickel or silver sublayer. (23) Rhodium on nickel or silver sublayer. (24) Passive. (25) Passive with paint-and-varnish coating. (26) Chemical or oiled anodized oxide. (27) Chemical oxide with paint-and-varnish coating. (28) Aluminum and its alloys. (29) Nickel on copper sublayer. (30) Chemical nickel. (31) Chromium. (32) Chromium on nickel sublayer. (33) Chromium on copper and nickel sublayer. (34) Silver on nickel and copper sublayer. (35) Chrome-plated chemical oxide. (36) Oiled chemical oxide. (37) Chrome-plated chemical oxide with paint-and-varnish coating. (38) Phosphate-coated oxide with paint-and-varnish coating. (39) Water-filled anodized oxide. (40) Chrome-plated anodized oxide.

Table 1 (cont'd).

(1) Основной металл	(2) Вид покрытия по ГОСТ 9791—68	(3) Условия эксплуатации по ГОСТ 14007—68			
		Л (4)	С (5)	Ж (6)	СЖ (7)
(8) Алюминий и его сплавы	(9) Окисное анодизационное с хроматированием и лакокрасочным покрытием	+	+	+	+
	(10) Окисное анодизационное с промасливанием	+	+	+	+[5]
	(11) Окисное анодизационное наполненное водой с лакокрасочным покрытием	+	+	+	+[5]
	(12) Окисное анодизационное из хромового электролита с лакокрасочным покрытием	+	+	+	+
	(13) Окисное анодизационное твердое	+	+	+	+
	(14) Окисное анодизационное твердое с лакокрасочным покрытием	+	+	+	+
	(15) Окисное анодизационное эматалевое	+	+	+[6]	—
	(16) Окисное анодизационное с покрытием лаками	+	+	+	—
	(16а) Окисное электроизоляционное	+	+	+	+
(17) Цинк и его сплавы	(18) Никелевое по подслою меди	+	+	—	—
	(19) Хромовое по подслою меди и никеля	+	+[6]	+[6]	—
	(20) Фосфатное с хроматированием	—	+[6]	+[6]	—
	(21) Фосфатное с хроматированием и лакокрасочным покрытием	—	+	+	+
(22) Магний и его сплавы	(23) Окисное химическое с лакокрасочным покрытием	+	+	—	—
	(24) Окисное анодизационное с лакокрасочным покрытием	+	+	—	—

KEY: (1) Base metal. (2) Type of coating according to GOST 9791-68. (3) Operating conditions according to GOST 14007-68. (4) Mild. (5) Moderate. (6) Severe. (7) Very severe. (8) Aluminum and its alloys. (9) Chrome-plated anodized oxide with paint-and-varnish coating. (10) Oiled anodized oxide. (11) Water-filled anodized oxide with paint-and-varnish coating. (12) Oxide anodized from a chromium electrolyte with paint-and-varnish coating. (13) Hard anodized oxide. (14) Hard anodized oxide with paint-and-varnish coating. (15) Anodized enamel [?] [enatalevoye] oxide. (16) Anodized oxide with lacquer coating. (16a) Insulating oxide. (17) Zinc and its alloys. (18) Nickel on copper sublayer. (19) Chromium on copper and nickel sublayer. (20) Chrome-plated phosphate. (21) Chrome-plated phosphate with paint-and-varnish coating. (22) Magnesium and its alloys. (23) Chemical oxide with paint-and-varnish coating. (24) Anodized oxide with paint-and-varnish coating.

Note: The "+" sign means that the coating can be used under these operating conditions. The "-" sign means that the coating cannot be used under these operating conditions.

FOOTNOTES:

[1]Permitted in technically substantiated cases.

[2]Not permitted for parts intended for operating in a marine atmosphere.

[3]Permitted for parts intended for operating in a humid tropical climate.

[4]Not permitted for parts subjected to the effect of sea water spray.

[5]Not permitted for parts intended for operating in a marine atmosphere. In technically substantiated cases, it is permitted for parts intended for operating in a humid tropical climate.

[6]Not permitted for parts intended for operating in open air and parts intended for operating under an awning in humid tropical and marine climates.

[7]Not permitted for parts intended for operating in open air.

5. The types of coatings not indicated in Table 1 can be covered by branch standards.

6. When necessary, coatings provided for more severe operating conditions can be used under less severe conditions.

7. The operating conditions indicated in the technical requirements for an article should not be completely extended to the parts and modules of this article. The specific operating conditions of a given part or assembly unit are determined from GOST 14007-68.

8. Protective methods corresponding to less severe operating conditions than those established in GOST 14007-68 are permitted for specific types of parts or articles:

during the operation of articles under airtight conditions providing the total absence of contact of the article with the external environment;

under conditions of operation under a layer of lubricant;

when the article is given special maintainence;

when the article's service life is shorter than that of the protective coating.

9. In technically substantiated cases, if the manifestation of isolated foci of corrosion during operation does not disturb the working capacity or impair the commercial appearance of the article, the coating selection standards permit the use of other types of coatings and define the need for applying coatings or additional protection.

10. Articles which operate in an oil medium, which does not cause corrosion, can be used without coatings.

11. Thinner coatings can be applied to articles on which coatings with the thicknesses indicated in the technical documentation cannot be used due to coupling conditions, as long as these articles are additionally protected.

In certain cases, the coupling area in nondetatchable couplings should be covered with primer, lacquer or glue before assembly, while an anticorrosion lubricant should be applied to the coupling area in detatchable couplings. After assembly, the outer parts of the article must be covered with primer, lacquer, glue, or enamel.

The above additional protection should be approved by the design or technological documentation.

12. In order to provide the required coupling of parts into assembly components, it is permissible to reduce the dimensions of the parts before applying coatings with consideration of the necessary thickness of the coatings.

13. It is not recommended that electrodeposited or chemical coatings be applied to a metal fitting after it has been partially pressed into plastic.

14. The surface of a part in deep or narrow holes, small channels, gaps and slits, which do not need any electrodeposited coatings, should be protected from corrosion with lubricants or paint-and-varnish coatings, depending on the purpose of the part and the operating conditions.

15. Coatings cannot be applied to detatchable modules in the assembled form.

16. Coatings should be applied before assembly on articles joined into modules by screws, spot welding, riveting, press-fitting, etc.

17. If a coating is damaged during the riveting or lamination process, the place with the damaged coating must be protected with paint-and-varnish coatings. After this, the modules or their individual parts can also be treated with a water-repellent fluid.

18. Electrodeposited and chemical coatings can be applied to articles with angular, intricately-shaped, radial or similar seams made by gas, electric arc, or argon arc welding of butt or lap joints and articles with soldered joints, as long as the welding seam is continuous over the entire perimeter, keeping the electrolyte from leaking into the seam.

19. Electrodeposited or chemical coatings can be applied before or after welding or riveting on assembly units joined by spot or contact welding, broken-seam welding, or riveting:

when the joint is made by gluing-welding without gaps;

during welding or riveting on current-conducting ground;

when the seam is preliminarily sealed;

when the design of the joint or special technological holes make it possible to remove the electrolyte.

Under severe and very severe operating conditions, these coatings should be applied to parts before welding or riveting. Under these operating conditions, paint-and-varnish or metallating coatings should be applied to the articles, as well as electrodeposited or chemical coatings.

20. It is recommended that primarily paint-and-varnish, metallating and condensed coatings be applied to protect cast articles of all metals and alloys from corrosion under all operating conditions.

Under mild operating conditions, to apply electrodeposited and chemical coatings can be applied to articles made of ferrous and nonferrous metals and alloys (except for aluminum and magnesium) cast by any method.

Under moderate operating conditions, electrodeposited and chemical coatings can be applied to articles made of ferrous and nonferrous metals and alloys (except for aluminum and magnesium) cast in a permanent mold, under pressure, and from wax patterns.

It is not recommended that electrodeposited and chemical coatings be applied to cast articles made of any metals and alloys, under severe and very severe operating conditions, as well as to aluminum and magnesium under all operating conditions and cast iron under moderate operating conditions; the possibility of applying these coatings in technically substantiated cases should be indicated in the coating selection standards.

21. For internal parts of parts working under severe and very severe operating conditions, when the exchange of air between the internal space of the article and the external environment is hampered and organic materials capable of liberating volatile agressive substances as they age are present in this closed space, zinc coatings cannot be used without additional protection with paint-and-varnish coatings.

22. Under severe and very severe operating conditions of articles intended for operation in a humid tropical climate, it is recommended that cadmium coatings be applied when it is necessary to preserve the commercial appearance of the coating, and zinc - when it is not necessary to preserve the commercial appearance of the coatings.

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